

# Gaming the four Scenarios

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## Scenario 1

### Scenario 1: Early

#### 1) Purpose

- a) This is an early Stage 1 bookend from the federal agency perspective. It asks, how would the environment fare if the EWA had no assets than are already available (i.e., b(2) and E/I relaxations) or already part of the CALFED Program (ERP flows)? How close to stated target supply and water quality targets would the Projects get?

#### 2) Assets/ Division of Assets

- a) Eco managers get b(2) water as per DOI criteria. Also, able to (1) flex E/I, borrow storage capacity, borrow storage (with collateral). ERP water of 100 kaf available to EWA? [this is worth discussion].
- b) Water Projects get all else, to wit:
  - i) Increased Banks (expansion of time during which Banks =  $6.6 + 1/3$  SJR)
  - ii) Top priority JPOD
  - iii) DMC/ Ca Aqueduct 400 cfs intertie.
  - iv) Lake Almanor releases
  - v) MWD source shifting (60 kaf).
  - vi) Water purchases (funded by CALFED) from Kern (wet and dry year purchases)
  - vii) Access to storage in Semitropic (funded by CALFED) of 100 kaf.

#### 3) How to model, how to game

- a) (WQCP + VAMP SJR flows) - (pre WQCP) DWRSIM run (as described in Ron Ott memo) gives federal share of WQCP impacts. These are subtracted from total b(2) water each year to give what is available for the game.
- b) Now add all modelable Project assets to generate a baseline run for gaming purposes. All assets above are modelable except Lake Almanor and MWD source shifting. In the short term, Kern water purchases may also need to be gamed.
- c) We will need to understand how to account for b(2) water.

#### 4) Now run the game:

- a) Environmental managers use available assets to protect fish as best they can.
- b) Projects attempt to recover from changes in operations due to b(2) (to the extent this is allowed under the b(2) criteria). Includes MWD source shifting and [perhaps, requires discussion on b(2) criteria] additional export pumping to compensate for reduced San Luis storage.
- c) Water quality managers may also alter operations in order to improve water quality. We will keep a separate account of supply changes due to such operations. We should probably allow for a sharing of costs between the environmental and water quality accounts. E.g., if an export reduction in March is warranted both for wq and fish reasons, then we should split the water cost in some fashion.

#### 5) Post Processing

- a) Analyze and add supplies due to Lake Almanor, Kern purchase into Project supplies. Add any supply recovery due to reoperation.

- b) Estimate water supplies provided as a result of the game (=base run supplies, as modified by actions taken in the game by the eco manager and the Projects).
- c) Estimate additional water needed to meet water supply and water quality targets.
- d) Convert water supply changes during the game plus and post processed supplies (e.g., Lake Almanor) into DWRSIM metric. This will not be easy, since DWRSIM based upon 73 year analysis, while game will cover 15 years at most. Should be able to roughly correlate changes in water supply during gaming to overall DWRSIM delivery projections.
- e) Convert total additional water needed for supply targets and wq into DWRSIM metric in the same fashion.
- f) Post process at least one Trinity Decision scenario. This might be done by adding new Trinity flow patterns to the DWRSIM run used in this game. Then, modify the daily game model to match the new inflow hydrology. The effects of the decision would ripple through the game and give new values for entrainment effects, water quality, and water supply. Some additional gaming might be needed to make adjustments to the game record if the changes in Trinity flows would have significantly changed operational decisions

#### 6) Data outputs/ Information

- a) Environmental [needs discussion]
  - i) Various measures of entrainment effects by species
    - (1) Raw values by year/ year type
    - (2) Normalized values (to some index of population) by year/ year type
    - (3) Normalized values (using adult equivalents) by year/ year type
    - (4) Comparison to entrainment effects in baseline and in NMFS/USFWS prescriptive stds.
    - (5) [should these be expressed in terms of salvage or overall mortality?]
  - ii) Changes in X2/ Delta outflow during Feb-March period by year type and comparison to 1962 LOD.
  - iii) Changes in QWEST during period of prescriptive stds and comparison to stds.
  - iv) Percent of AFRP/ ERP upstream flow targets met compared to baseline by year/ year type.
  - v) After Scenario 4 has been run, we will have an operational description of the Early Stage 1 biological bar. The operational changes to protect fish in this scenario (and their biological consequences) could then be compared to the operational changes in the Early Stage 1 biological bar. Comparison could involve both entrainment estimates and operational actions (e.g., did the cuts in March of 1992 in this scenario match the cuts in the Early Stage 1 biological bar?).
- b) Water supply
  - i) Supply from DWRSIM baseline run
  - ii) Change in supplies during game.
  - iii) Change in supplies caused by game, but converted into DWRSIM metric.
  - iv) Additional supplies needed to meet water user targets during game.
  - v) Additional supplies needed to meet water user targets, converted into DWRSIM metric.
- c) Water quality
  - i) Change in water quality parameters of interest
  - ii) Comparison of wq outputs of game with baseline wq and wq targets.
  - iii) Additional water needed during game to meet wq targets.
  - iv) Additional water needed to meet wq targets, converted into DWRSIM metric.

### Scenario 1: Late

#### 1) Purpose

- d) This is a late Stage 1 bookend from the federal agency perspective. It asks, how would the environment fare if the EWA had no assets than are already available (i.e., b(2) and E/I

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relaxations) or already part of the CALFED Program (ERP flows)? How close to stated target supply and water quality targets would the Projects get in late Stage 1.

## 2) Assets/ Division of Assets

- a) Eco managers. Same as Scenario 1: Early
- b) Projects: same as Scenario 1: Early, except Water Projects also get:
  - i) Increased Banks capacity to 10.3 year round.
  - ii) Delta Island storage (120 kaf Webb Island. 120 kaf Bacon Island. Bacon connected to Clifton Court and Tracy via 2 kcfs connector. Bacon and Webb independent rights to 4 kcfs diversion each, provided standards/ conditions met.
  - iii) Efficiency water. 100 kaf per year of reduced demand (70 kaf reductions in MWD. 30 kaf in Santa Clara)
  - iv) Shasta Dam expansion 290 kaf.
  - v) New Groundwater storage (needs further definition).
- c) Water Quality
  - i) Blending: Purchase EBMUD water (via efficiency?) and deliver to CCWD for blending.

## 3) How to model, how to game

- a) Use same federal share of WQCP impacts from Scenario 1: Early.
- b) Now add all modelable Project assets to generate a baseline run for gaming purposes. Increased Banks and Shasta Dam increase are modelable now. Groundwater storage and Delta Island storage may be modelable in the future, but may need to be gamed for now. Efficiency will be post processed.

## 4) Now run the game:

- a) No change in method from Scenario 1: Early.

## 5) Post Processing

- a) Analyze and add any project supplies due to Lake Almanor, Kern purchase, efficiency, new groundwater storage, reduced ET from Delta islands, and Delta island storage. In future iterations, some of these may be gamed. Add any supply recovery due to project reoperation.
- b) Estimate additional supply benefit from Banks expansion which are undervalued by DWRSIM.
- c) Post Process the water quality benefits to CCWD from blending.
- d) The rest, the same as in Scenario 1: Early.

## 6) Data outputs/ Information

- a) Environmental [needs discussion] -- same
- b) Water supply -- same.
- c) Water quality -- same

## Scenario 2

### 1) Purpose

- a) This scenario changes the balance from Scenario 1: Early somewhat in favor of the environmental manager. [Note -- Not clear that this really adds much new information -- DF]

### 2) Assets/ Division of Assets

- a) Same as Scenario 1: Early, except that Eco managers get addition assets.
  - i) Shift the following assets from the Projects to the eco manager:
    - (1) MWD source shifting

- (2) Kern Water purchases
- (3) Access to Semitropic storage

### b) Water Projects get all else, to wit:

- i) Increased Banks (expansion of time during which Banks =  $6.6 + 1/3$  SJR)
- ii) Top priority JPOD
- iii) DMC/ Ca Aqueduct 400 cfs intertie.
- iv) Lake Almanor releases

### 3) How to model, how to game

- a) Same as Scenario 1: Early, except that DWRSIM base run must not have Kern Water purchases or access Semitropic storage.

### 4) Now run the game:

- a) No change except for assets. This is similar enough to Scenario 1: Early, that we could use that game as the starting point for this game, saving considerable time.

### 5) Post Processing

- a) Same except that Kern purchase no longer a water user asset.

### 6) Data outputs/ Information

- a) No change

## Scenario 3

### 1) Purpose

- a) This is another Stage 1 bookend from the federal agency perspective. It defines what operational choices would meet the "biological bar" in late stage 1. It also analyzes the water supply and water quality implications of the biological bar, given maximum build up of assets during stage 1 and some reasonable sharing formula.

### 2) Assets/ Division of Assets

- a) Eco managers get:
  - i) Rights to Banks above 6.6 kcfs from April -- August.
  - ii) MWD Source Shifting (first option)
  - iii) Kern Purchases
  - iv) Semitropic storage
  - v)  $\frac{1}{2}$  Bacon storage,  $\frac{1}{2}$  Webb storage,  $\frac{1}{2}$  of intakes, discharge, conveyance capacity of islands.
  - vi) Above normal and wet year efficiency water.
  - vii) 250 kaf of new gw storage [needs definition].
- b) Projects:
  - i) Increased Banks capacity September -- March.
  - ii)  $\frac{1}{2}$  Bacon storage,  $\frac{1}{2}$  Webb storage,  $\frac{1}{2}$  of intakes, discharge, conveyance capacity of islands.
  - iii) Below normal, dry and critical year efficiency water.
  - iv) 250 kaf of new gw storage. [needs definition]
  - v) Shasta Dam expansion 290 kaf.
- c) Water Quality
  - i) Blending: Purchase EBMUD water (via efficiency?) and deliver to CCWD for blending.

### 3) How to model, how to game

- a) Use same federal share of WQCP impacts from Scenario 1: Early.
- b) Now add all modelable Project assets to generate a baseline run for gaming purposes. Increased Banks and Shasta Dam increase are modelable now. Groundwater storage and Delta Island

storage may be modelable in the future, but may need to be gamed for now. Efficiency will be post processed.

4) Now run the game:

- a) This game differs from Scenario 1: Late and Scenario 2 in that the eco managers are no longer constrained by any budget of assets. The eco assets will be used to the extent possible, but additional water acquisition will be assumed to the extent necessary to meet the late Stage 1 biological bar.
- b) As before, the Projects attempt to maximize supplies.
- c) As before, the water quality managers may intervene to improve water quality. Possible division of costs of actions with environmental accounts.

5) Post Processing

- a) Analyze and add supplies due to Lake Alimanor, Kern purchase, efficiency, new groundwater storage, reduced ET from Delta islands, and Delta island storage to Project supplies. In future iterations, some of these may be gamed. Add any supply recovery generated through reoperation.
- b) Summarize the additional water needed to meet the biological bar above and beyond current EWA assets.
- c) The rest, the same as in Scenario 1: Late.

6) Data outputs/ Information

- a) Environmental [needs discussion]
  - i) Additional water supplies needed to meet late Stage 1 biological bar.
  - ii) Convert these supplies into the DWRSIM metric.
- b) Water supply -- same as Scenario 1: Late
- c) Water quality -- same as Scenario 1: Late

Scenario 4

Same as Scenario 3, but use asset list and sharing from Scenario 2. "Biological bar" may be lower for this scenario, since it assumes beginning of stage 1 conditions.